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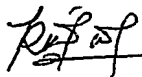
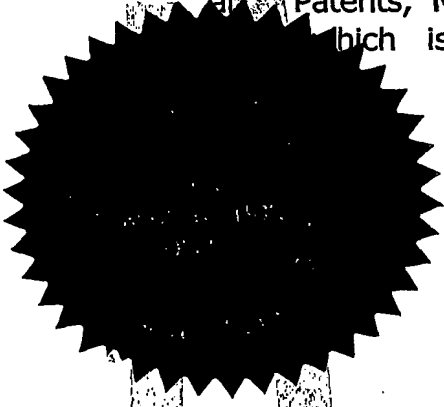
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PATENT APPLICATION NO: PI 2003 2471

This is to certify that annexed hereto is a true copy from the records of the Registry of Trade Marks and Patents, Malaysia of the application as originally filed which is identified therein.

By authority of the
REGISTRAR OF PATENTS



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CERTIFICATE OF FILING

APPLICANT : ONG CHIN CHAI
APPLICATION NO : PI 20032471
REQUEST RECEIVED ON : 01/07/2003
FILING DATE : 11/08/2003
AGENT'S/APPLICANT'S FILE REF. : PD/2003-06/26

Please find attached, a copy of the Request Form relating to the above application, with the filing date and application number marked thereon in accordance with Regulation 25(1).

Date : 11/08/2003



(MOHD. AMRAN ABAS)
for Registrar of Patents

To : SAHANI AHMAD
SIRIM BERHAD, 1,
PERSIARAN DATO' MENTERI, SEKSYEN 2,
40911-SHAH ALAM
MALAYSIA

Patents Form No. 1
PATENTS ACT 1983

REQUEST FOR GRANT OF PATENT
[Regulations 7(1))

To : The Registrar of Patents
Patent Registration Office
Kuala Lumpur,
Malaysia

For Official Use

APPLICATION NO. : PI 20032471

Filing Date : 01-07-2003

Request received on : 01-07-2003

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Amount : RM 200

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RHB 390020

Date of mailing :

Please submit this Form in duplicate
Together with the prescribed fee.

Applicant's or Agent's file reference :

PD/2003-06/26

**THE APPLICANT(S) REQUEST(S) THE GRANT OF A PATENT IN RESPECT OF THE
FOLLOWING PARTICULARS**

I. TITLE OF INVENTION : PILE ANCHOR HEAD FOR AN UNDERPINNING PILE
AND METHOD FOR PRELOADING THE SAME

II. APPLICANT(s) the data concerning each applicant must appear in this box or, if the space is
insufficient, in the space below)

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* Permanent residence or principal place of business :

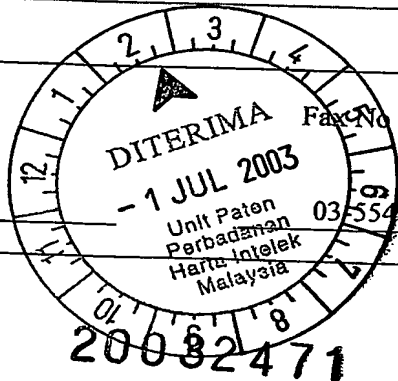
- as above -

Telephone No. (if any)

03-55446131/
03-55446134

Fax No (if any)

03-55446146



Additional Information (if any) :

III. INVENTOR

Applicant is the inventor

Yes

☒

No

☐

If the applicant is not the inventor :

Name of inventor : ONG CHIN CHAI

Address of inventor : 98A Jalan laksanama 5
Taman Kota Laksamana
75200 Melaka

A statement justifying the applicant's right to the patent accompanies this Form :

Yes

☐

No

☒

Additional Information (if any)

IV. AGENT OR REPRESENTATIVE

Applicant has appointed a patent agent in accompanying Form No. 17

Yes

☒

No

☐

Agent's Registration No. :

PA/99/0082 and/or PA/99/0081 and/or PA/2000/0104 and/or
PA/99/0085 and/or PA/2000/0099 and/or PA/2000/0096

Applicants have appointed

A. Rahman Zuhri and/or Mohamad Nawawi Hussin and/or
Sahani Ahmad and/or Mary Anne Thoo Siat Lim and/or
Dr. Margaret Chai Sook Yin and/or Titi Dolai Ab. Kahar

To be their common representative

V. DIVISIONAL APPLICATION

This application is a divisional application

☐

The benefit of the
filing date

priority date

☐

of the initial application is claimed in as much as the subject-matter of the present application is contained in the initial application identified below :

Initial Application No. :

Date of filing of initial application :

VI. DISCLOSURE TO BE DISREGARDED FOR PRIOR ART PURPOSES

Additional information is contained in supplemental box :

(a) Disclosure was due to acts of applicant or his predecessor in title ☐

Date of disclosure: _____

(b) Disclosure was due to abuse of rights of applicant or his predecessor in title ☐

Date of disclosure: _____

A statement specifying in more detail the facts concerning the disclosure accompanies this Form

Yes ☐

No ☐

Additional Information (If any)

VII. PRIORITY CLAIM (if any)

The priority of an earlier application is claimed as follows :

Country (if the earlier application is a regional or international application, indicate the office with which it is filed) :

Filing Date : _____

Application No. : _____

Symbol of the International Patent Classification : _____

If not yet allocated, please tick ☐

The priority of more than one earlier application is claimed:

Yes ☐

No ☐

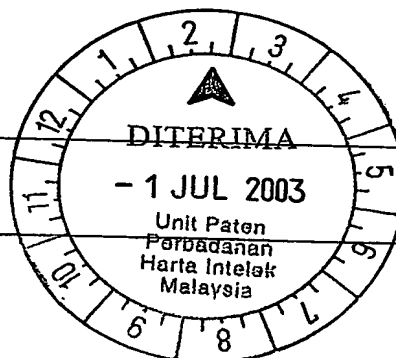
The certified copy of the earlier application(s) accompanies this Form:

Yes ☐

No ☐

If No, it will be furnished by

Additional Information (if any) :



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VIII. CHECK LIST

A. This application contains the following :

1. request		Sheets
2. description	8	Sheets
3. claim	2	Sheets
4. abstract	1	Sheets
5. drawings	3	Sheets
Total	14	Sheets

B. This Form, as filed, is accompanied by the items checked below (please tick where appropriate):

- (a) signed Form No. 17 ☒
- (b) declaration that inventor does not wish to be named in the patent assignment ☐
- (c) statement justifying applicant's right to the patent ☐
- (e) priority document (certified copy of earlier application) ☐
- (f) cash, cheque, money order, banker's draft or postal order for the payment of application fee ☐
- (g) other documents (specify) – Form 5 ☒

IX. SIGNATURE

SAHANI AHMAD
**(Applicant/Agent)

1/7/03
(Date)

If Agent, indicate Agent's Registration No. : PA/2000/0104

For Official Use

1. Date application received :
2. Date of receipt of correction, later filed papers or drawings completing the application :

* Delete whichever does not apply

** Type name under signature and delete whichever does not apply

PNMB., K.L.

**PILE ANCHOR HEAD FOR AN UNDERPINNING PILE
AND
METHOD FOR PRELOADING THE SAME**

1.0 Technical Field of the Invention

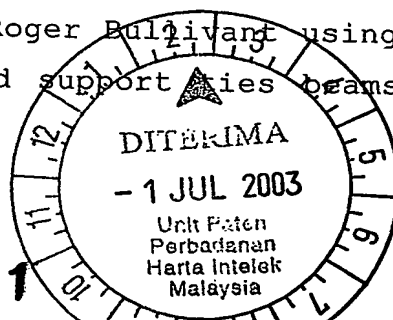
5 The present invention relates generally to an underpinning pile, especially to an underpinning pile having an improved pile anchor head for an improved pile efficiency and load capacity.

2.0 Background of the Invention

10 Prior art teaches various methods for underpinning to strengthen settling foundation, via primarily two types of underpinning namely the active and passive underpinning pile. Further, most of the methods are adapted for underpinning a wall foundation rather than a typical large
15 pile cap which carries a concentrated load from the structural concrete frame of the building.

In passive underpinning pile, the new pile is inserted adjacent to the existing settling foundation and then it is either bonded or connected to the pile cap or footing by
10 means of a cantilever bracket, ties or enlarged footings. The settling foundation is allowed to settle further until the passive underpinning pile becomes loaded gradually with time. Such method has weakness as continuing settlement can occur over a long period especially if the pile is deep.
15 Such use of passive underpinning pile is common as in the US pat no:- 4,834,582 by Roger Bulfinch using slanted cast in situ concrete piles and support ties beams. In the UK pat

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no:- 2,047,303 by Leonard Flowerday it has a vertical pile but a concrete cantilever corbel to carry the adjacent footing.

5 In an active underpinning pile, a certain amount of preloading is applied instantaneously upon the underpinning pile to support the weakened foundation preventing it from any further settlement. Existing method in the prior art uses a system of complicated prefabricated steel brackets in conjunctions with an arrangement of screws, rams or
10 hydraulic jacks reacting against the existing weak foundations. In some cases very cumbersome apparatus consisting of twin jacks or rams are used to react against the newly installed underpinning pile. Further weakness in the system lies in some due to use of many complicated small
15 parts which may deteriorate and thus unable to carry large load if any key mechanism is damaged by wear or rust.

In the US pat no:- 5,120,163 by Holdeman it has an inverted U-shaped coupler adapted to be temporarily secured to the foundation support to allow the hydraulic jack to react
20 between the screw pile and footing. This method has many small screws and many other interconnecting parts, thus is adapt only to carry smaller load due to the slant screw piles. This features is also quite similar to the US pat:- 5,213,448 by Seider using a bracket for uplifting the
25 footings.

In the US Pat no:- 2002/0176749 A1 by Provost it has an oversized anchor pile driven at 15 degrees slant at the

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foundation edge and installing an anchor jack-plate having a collar and gusset attached thereto slidable upon the screw anchor shaft. The eccentricity of the floating piers 16 reduces the capacity of the pile and is a source of weakness due to shearing in the jack plate and bending in the pile.

5 In the US pat no:- 3,796,055 by Mahony , it uses a method and apparatus for lifting the foundation by using gripping the sides of the pipe to drive it vertically against the adjacent foundation in conjunction with jacks at each number of specified stations to lift the foundation and raising
10 portions of the buildings foundation to further include the step of dispersing a body of harden able cementations material outwardly of and below the lower end of the said pipe to an enlarged hardened region of subterranean support resting on top of the said pipe. This method is adapted for
15 small load transfer as the enlarged cementations material might shear easily.

In the US Pat no:- 5,433,556 by Freeman III , it uses a pier driving assembly which includes a pier driving bracket which drives the pier pipes into the ground. This method is not
20 suitable for underpinning inside the building due to the massive and deep excavation underneath the existing weakened foundations

In the UK Pat no:- 2,190,693 A by Frank Whittaker , it uses an underpinning device for a wall structure comprising of a
25 bracket member 35 extending from a rectangular or tabular, hollow box-like member 34 locatable over the top a

previously driven support pile. In addition an adjustable support means 37, 38 located on the said bracket 35. This system of cantilever demands that the pile is capable of overcoming the bending resistance from the bracket cantilever member and thus anticipated for in use with steel pipes or such that can offer corresponding bending resistance. Deep excavation underneath the footing to allow accesses to the placing of jacks or adjustable support means also wider and extensive excavations apart from the reduced capacity of the pile due to bending.

In the UK Pat no:- 2,150,612 A by Arthur Joseph Steel, it uses a system for underpinning a wall foundation comprising of driving a plurality of tabular sleeves 13 by using hydraulic jacks into which concrete is poured into and allowed to hardened. This is also similar in principle as in the UK Pat no: - 2,024,283 A by John Patrick Jones except that the pile has a central aperture running there through. Both methods involve waiting time in concrete curing and workability problems due to delays as well as deep and wide excavations involved.

In UK pat no:- 2,255,990 by Roger A Bullivant it uses a method of supporting the foundation by removing a short length of two or three courses of brick and supporting the building above the removed portion on a joist 14 with a pile connector 16 resting on a jack 28. The jack is stressed and the pile connector slides through the pipe pile and fixed to it after stressing. This method uses the jack to react against the existing footing and thus only certain

reaction force is available from the old footing. The eccentricity of the pile connector 16 causes a large shearing and bending on the welds connecting the portion of C-channel to the pipe shaft 12. This method again is adapted for a low load like in a wall foundation.

Pending Malaysian patent no: - PI 20005487 filed by the same applicant discloses an underpinning pile system that works rather similarly to the present invention. However, PI 20005487 employs welding rather extensively which results in a slower process, inconsistent quality and costly operation. Apart from those problems, safety is another concern since welding parts may snap and cause serious hazards to workers. Therefore there arises a need for a brand new design that eliminates or reduces the above problems drastically. The new design should be easy to handle with an added bonus of fast, efficient and safer than underpinning pile system of the prior art.

3.0 Summary of the Invention

Accordingly, the object of the present invention is to provide an efficient, simple and sure method in driving, lifting settling foundation at the same time securing the direct transference of preload from the building into the newly installed underpinning pile without further loss of preload.

Another object of this present invention is to provide a simple yet reliable pile anchor head such that the system can be assembled easily inside the excavation pit and

preloaded with easy accesses to the critical welds instead of adjusting screws or placing jacks in a cumbersome and inaccessible work space underneath the footing.

5 The present invention teaches a method of assembly and method of installation of the pile head and apparatus for preloading and ease of locking off reliably at the required load.

10 The present invention also provides a simple way of driving the underpinning pile into the ground inside the excavation hole independently by way of using the underpinning pile system apart of using other additional machinery to install the pile.

15 The present invention also provides a simple way of pre-testing the capacity of the newly installed underpinning pile by directly jacking against the top of the pile to obtain a Load verses Settlement curve whilst during preloading thus making it available an economical and versatile load test at the same time.

20 Yet the most significant aspect of the present invention is that the pile anchor head is adapts to receive the building load and transfer it to practically any kind of material and shape of the pile without restricting only to the common use of steel pipes in underpinning.

According to the broadest aspect of the present invention, these and other objectives are accomplished by:-

An underpinning pile (1) for lifting and strengthening a settling foundation comprising of;

a pile (12);

said pile (12) being provided with a pile anchor head (11);

5 characterized by

said pile anchor head (11) being provided with a lifting means for lifting said settling foundation.

In another aspect, an underpinning pile system (7) for strengthening the existing settling foundation

15 comprising of:-

a pile (71);

a pile anchor head (72)

jacking means (73);

characterized by

20 said pile anchor head (72) being provided with a lifting means.

In another aspect, a method for using an underpinning pile system (5) for lifting and underpinning a settling foundation comprising the steps of;

25 excavating a hole adjacent to said settling foundation;

placing a pile anchor head (51) inside the excavation hole;

laying of transfer beam (53) such that said transfer beam (53) sits on the flange (51a) of said pile anchor head (51);

installing a jacking means (55);

26 placing a pile (52) through a tabular hollow section of said pile anchor head (51);

driving said pile (52) to set ; and

locking off said pile (52) to said pile anchor head (51).

It should be appreciated that the scope of the present invention need not be limited to the particular scope of the embodiments described above.

4.0 Brief Description of the Drawings

5 For further understandings of the aspects of the present invention and their advantages will be discerned after studying the Detailed Description in conjunction with the accompanying drawings in which:-

10 Fig 1 showing an underpinning piling according to one embodiment of the present innovation.

Fig 2 showing an 'underpinning piling system and the auxiliary's apparatus.

15 Fig 3a showing a typical pile anchor head with optional attachments of triangular wedges with nuts and bolts at corresponding positions to match the transfer beam.

Fig 3b showing another variation of the typical pile anchor head with a wider out splayed flange and web.

Fig 4 installing a two C-channel side by side on each side of the pile anchor head.

20 Fig 5 showing the placing of the thrust block into the space between the gap of the parallel C-channel and inserting of the two large pin into the receiving holes at the ends of the thrust block just clearing beneath the soffit of the parallel C-channel.

25 Fig 6 showing the placing of hydraulic jack over the top of the underpinning pile.

Fig 7 showing the detailed close up of the completed pile anchor head preload.

5.0 Detailed description of the inventions

Referring to the drawings, like numerals indicates like components to facilitate explanation. In order to differentiate two separate entities belonging to the like components, a suffix 'a' or 'b' is used to denote the first or second entity respectively.

5.1 Components of the Assemblage

Referring now to fig .1 showing the underpinning pile (1) components according to one embodiment of the present invention. In the broadest aspect of the present invention, the underpinning pile (1) comprises a pile (12), a pile anchor head (11) and a lifting means for lifting the settling foundation. The pile (12) can be any kind of material and shape such as timber, concrete, ex-rail piles or steel pipes.

The pile anchor head (11) of the present invention is redesigned to have a rectangular body with a tabular hollow section (16) in the middle for accommodating a pile. The body is made from two L-section joined back to back by a plate. Thus, a flange (13) is on two opposite flat parallel surface at sides of the pile anchor head (11) to act as a lifting means so a transfer beam can rest on each opposing side. A fastening pin (15) may also be optionally used as the lifting means and certain circumstances may render both the flange (13) and the fastening pin (15) be used in combination. Further, the pile anchor head (11) is designed to have a locking means for locking off the pile anchor head (11) to the pile (11).

One of the possible locking means is a pile anchor head plate (17) that has a size slightly smaller than the tabular hollow section (16) so that it can be inserted into the tabular hollow section (16) and later welded or fastened.

5 This design looks simple but it has a significant improvement over the prior art. The introduction of the lifting means eliminates altogether welding for holding the transfer beam. This has a tremendous advantage over the prior art system in term of load capacity, efficiency and
10 safety. Another significant inherent advantage of the present pile anchor head (11) is that shape and material of the pile (12) is not an issue because there is not welding required between the pile anchor head (11) and the pile (12). This means any shape like round, rectangular,
15 hexagonal and others, and any material shape such as timber, concrete, ex-rail piles or steel pipes can be used for the pile (11). The present invention permits a shallow excavation just sufficient to place the transfer beam underneath the settling foundation which is normally about 1
20 m or 1.5m deep whereas in some of the prior art, much deeper, wider and a more extensive excavation is required.

Referring now to Fig 2 showing an underpinning piling system and the auxiliary's apparatus. The underpinning pile system (2) of the present invention comprises a pile (22), a pile
25 anchor head (21), jacking means (25) and a transfer beam (23). As in previous description, the pile anchor head (21) is provided with a lifting means.

In another embodiment, the jacking means (25) includes a hydraulic jack (25a) and a thrust block (24). In the present invention, a hydraulic jack is used, but it must be understood that any kind of jacking means available in the market may be used.

The thrust block (24) has been redesigned to have a shape of an inverted U. It has a horizontal member (24a) with a vertical leg (24b) at each ends of the horizontal member (24a). A through hole (24d) is provided at each end of the vertical leg (24b) for accommodating a locking pin (24e). Just above the through hole (24d) is welded a piece of plate to form a wedge (24c) on each leg (24b) of the thrust block (24) so that the thrust block (24) can rest on the transfer beam (23). Advantageously a pair of wedges is provided on each leg (24b).

With the present design, the thrust block (24) is much neater and does not require rods to be welded to the top of the transfer beam (23). Two thick rods act as locking pins (24e) are capable of taking the shearing load by supporting the base of the thrust block (24) against the transfer beam (23). The locking pins (24d) is easily assembled and disassembled thus improving the efficiency as well as increasing the safety and speed of assemblage for preloading operations.

Referring now to Fig 3a and Fig 3b respectively that will be affixed to the top of the pile. The pile anchor head (3) as shown in Fig 3a is a hollow tabular section with extending

flanges (37) on two opposite sides at base of the hollow tabular section. On side of the pile anchor head (3) a web (36) with two matching bolts (31a) and holes (31) are provided. The webs (36) extends from the side of the hollow tabular section and meets with the flange (37) to form a L-shaped ledge. In another preferred embodiment of the present invention, a pile anchor head (3) is made with the extension of the flange out splayed (39) with a matching triangular web (38) to meet the flanges (39) at the ends as shown in Fig3b. In both pile anchor heads (3), the two flanges (39) carry almost the entire pre load transferred from the hydraulic jack, although some will be carried through the bolts (31b). The shape of the tabular hollow section of the pile anchor head (1) can be square, rectangular or any regular shape matching the pile (12) but preferably have a two flat parallel surface for the flanges (39) and web formation (38). The internal dimensions of the hollow tabular section of the pile anchor head (3) are such that it will fit snugly to accommodate the approximate cross-section of the pile (not shown). It is these two features that make the present pile anchor head a very versatile in use.

The pile anchor head (3) is also provided with a sufficiently thick pile anchor head plate (32) as shown in Fig 3a and Fig3b. The shape and dimension of the plate fits with a small tolerance of around 2mm inside the hollow tabular section of the pile anchor head (3). The pile anchor head plate (32) shall be locked off by welding to the inner surface of the hollow tabular section of the pile anchor head (3) upon reaching the required preload during

the final process of installation which will be described further herein in the Installation Process. The triangular wedges (33) are additional optional features depending on the capacity of the preload used to weld the pile anchor head (3) to the parallel C-channel transfer beam (not shown). It is also possible to omit the triangular wedges (33) and weld the top parallel sides (35) of the pile anchor head (3) to the parallel C-channel transfer beam (not shown).

5.2 Installation Process

Referring to Fig. 4 installing two C-channels side by side on each side to act as the transfer beam to transfer load from the settling foundation to the underpinning pile. A rather narrow and shallow pit measuring around 1m wide x 1m long x 1m deep is excavated adjacent the settling foundation (4). The pile anchor head (41) is then laid on the pit. Two C-channels are then inserted underneath the soffit of the foundation or ground beams (45) and eight bolts (not shown) are screwed in place to put the two C-channel securely bolted to the flanges of the pile anchor head (41). The two C-channels are welded together to form a transfer beam (43) using two steel plates (not shown) at inner facing sides of the C-channels at an approximate equidistance from and on each side of the underpinning pile (42).

Referring now to Fig 5 showing the placing of the thrust block into the space between the gap of the parallel C-channel and inserting of the two locking pins into the receiving holes at the ends of the thrust block just

clearing beneath the soffit of the parallel C-channel. The two legs of the inverted U-shaped thrust block (54) are inserted into the middle space between the gap of the transfer beam (53). The wedges which are attached to the outer opposite faces of the two legs of the thrust block (54) are placed over the gap of the transfer beam (53) so that the base of the triangular wedges rests squarely on the upper face of the transfer beam (53). The through the holes in the legs are just exposed beneath the transfer beam (53) so that the large solid locking pin (54a) can be slid through this through hole. This pair of large locking pin (54a) will then bear against the base of the transfer beam (53) to which it is in contact during jacking operation.

Referring to Fig 6 showing the placing of hydraulic jack over the top of the underpinning pile. The hydraulic jack (65) is placed centrally underneath the horizontal member of the thrust block (64) such that when the jack is activated the piston will extend to meet centrally at the pile anchor head plate (61a). The pile anchor head plate (61a) is positioned on top of the pile (62) and a hydraulic jack (65) is attached to the thrust block (64) such that the piston is just in contact with the pile anchor head plate (61a) which is lying on top of the pile (62).

A load of up to about 100-120% of the working load of the foundation is applied to the pile (62) until set and is held in that position for a pre-determined time. This causes a direct vertical resultant force from the hydraulic jack (65) against the pile anchor head plate (61a) on top of the pile (62). This will in turn pull the pair of large solid

locking pin (65a) upwards against the base of the transfer beam (63) thus resulting in lifting the foundation through the transfer beam (63) that is underneath the ground beam (6) or foundation.

5 In jacking operation, settlement of settling foundation is recorded at 15 minutes interval to check on the pile capacity. This means the pile (62) is capable of withholding the working load without appreciable inelastic settlement, usually at less 12.5mm. Upon confirmation of no further
10 appreciable loss of preload by reading off the pressure gauge of the hydraulic jack (65), the pile anchor head plate (61a) is then welded to the insides surfaces of the pile anchor head (61) in the process to effectively lock-off this preload. Further additional lines of welds on both sides of
15 the pile anchor head (61) that is in contact with the transfer beam (63) can be made. In addition, four or six triangular wedges (not shown) can also be welded to the anchor pile head (61) and the top flanges (63a) of the transfer beam (63) to form a very rigid integral pile anchor
20 head (61) with the transfer beam (63).

Referring now to Fig. 7 showing detailed close up of the completed pile anchor head preloaded (7). Upon satisfaction of the set point, the pile anchor head (71) is locked off to the pile (72) by welding the pile anchor head plate (71a) to
25 interior of the tabular hollow section (71e). Further strengthening (71c) can be done by welding a plurality of wedge (71b) to the transfer beam (73) and to the pile anchor head (71). Still, additional welding (71d) can be done

between the pile anchor head (71) and transfer beam (73). Upon completion of the welds, the pile (72) is deemed to be fully operational and the two locking pins (not shown) are removed from the thrust block (not shown). This will leave the preloaded pile (72) welded securely to the pile anchor head plate (71) and the transfer beam (73) supporting the building foundation beams (not shown). The efficiency of this weld enables very large loads up to 200 tons to be carried through each anchor pile head compared to the existing prior art system of adjusting brackets and locking off the screws which carries typically from about 1-10 tons. While the preferred embodiment of the present invention and their advantages have been disclosed in the above Detailed Description, the invention is not limited thereto but only by the scope of the appended claim.

What is claimed is:

1. An underpinning pile (1) for lifting and underpinning a settling foundation comprising of;
a pile (12);
5 said pile (12) being provided with a pile anchor head (11);
characterized by
said pile anchor head (11) being provided with a lifting means for lifting said settling foundation.
- 10 2. An underpinning pile (1) as claimed in Claims 1 further characterized by said lifting means is a flange (13).
3. An underpinning pile (1) as claimed in Claims 1 further characterized by said lifting means is a fastening pin (15).
- 15 4. An underpinning pile (1) as claimed in Claims 2 further characterized by said flange (13) being on two opposite flat parallel surface at sides of said pile anchor head (11) so a transfer beam can rest on each opposing side.
- 20 5. An underpinning pile (1) as claimed in Claim 1 further characterized by said the pile anchor head (11) having a tabular hollow section (16).

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6. An underpinning pile (1) as claimed in Claim 1 further characterized by said anchor head (11) being provided with a locking means.

5 7. An underpinning pile (1) as claimed in Claim 6 further characterized by said locking means being a pile head anchor plate (17).

10 8. An underpinning pile (1) as claimed in Claim 7 further characterized by the said pile head anchor plate (17) fits with a small clearance inside said tabular hollow section (16) of said pile anchor head (11).

9. An underpinning pile system (2) for lifting and underpinning a settling foundation comprising ;
a pile (22);
a pile anchor head (21);
15 jacking means (25);
a transfer beam (23);
characterized by
said pile anchor head (21) being provided with a
lifting means.

20 10. An underpinning pile system (2) for lifting and underpinning a settling foundation comprising ;
a pile (22);
a pile anchor head (21);
a jacking means (25);
25 a transfer beam (23);
characterized by

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said jacking means (25) includes a hydraulic jack (25a) and a thrust block (24).

5 11. An underpinning pile system (2) as claimed in claim 10 further characterized by said thrust block (24) comprising of a horizontal member (24a) with two vertical legs (24b) at the ends of the horizontal member (24a) into which nearing the end of the leg is made a through hole (24d) and on the same side of the this surface where the hole is made are attached a wedge (24c) on the opposing sides to allow
10 the thrust block (24) to rest on the transfer beam (23) via the base contact with said wedge (24c) in each leg (24b) to top edges of the transfer beam(23).

15 12. An underpinning pile system (2) as claimed in claim 10 further characterized by said thrust block (24) having two solid locking pins (24e) that can be slid through the through hole (24d) located at base of two legs (24b) of said thrust block (24) to create a reaction against base of said transfer beam (23) for said jacking means (25).

20 13. A method for using an underpinning pile system (5) for lifting and underpinning a settling foundation comprising the steps of;

excavating a hole adjacent to said settling foundation;
placing a pile anchor head (51) inside the excavation hole;
laying of transfer beam (53) such that said transfer beam
25 (53) sits on the flange (51a) of said pile anchor head (51);

installing jacking means (55);

placing a pile (52) through a tabular hollow section of said pile anchor head (51);
driving said pile (52) to set ; and
locking off said pile (52) to said pile anchor head (51).

5 14. A method for using an underpinning pile system (5) as claimed in claim 13 in which said laying of transfer beam (53) includes securing said transfer beam (53) to said pile anchor head (51).

10 15. A method for using an underpinning pile system (5) as claimed in claim 14 in which said securing is by welding a plurality of wedges (51b) to said transfer beam (53) and said pile anchor head (51).

15 16. A method for using an underpinning pile system (5) as claimed in claim 14 in which said securing means is a fastening pin (51c) fastening said transfer beam (53) and web (51d) of said pile anchor head (51).

17. A method for using an underpinning pile system (5) as claimed in claim 13 in which said jacking means (55) further comprises a thrust block (54) and a jack (55a).

20 18. A method for using an underpinning pile system (5) as claimed in claim 17 in which said thrust block (54) further comprising of a horizontal member with two vertical legs at the ends of the horizontal member into which nearing the ends of the leg are made a through hole and on the same
25 side of this surface where the hole is made are attached a wedge on the opposing sides to allow the thrust block to

rest on the transfer beam via the base contact with the wedge in each leg to the top edges of the transfer beam.

5 19. A method for using an underpinning pile system (5) as claimed in claim 17 in which said thrust block (54) having two solid bars (54a) that can be slid through the through hole located at the base of the two legs of the thrust block (54) to create a reaction against the base of the transfer beam(53) for the jacking means (55).

10 20. A method for using an underpinning pile system (5) as claimed in claim 13 in which said driving being carried out repeatedly on a plurality of pile (55a).

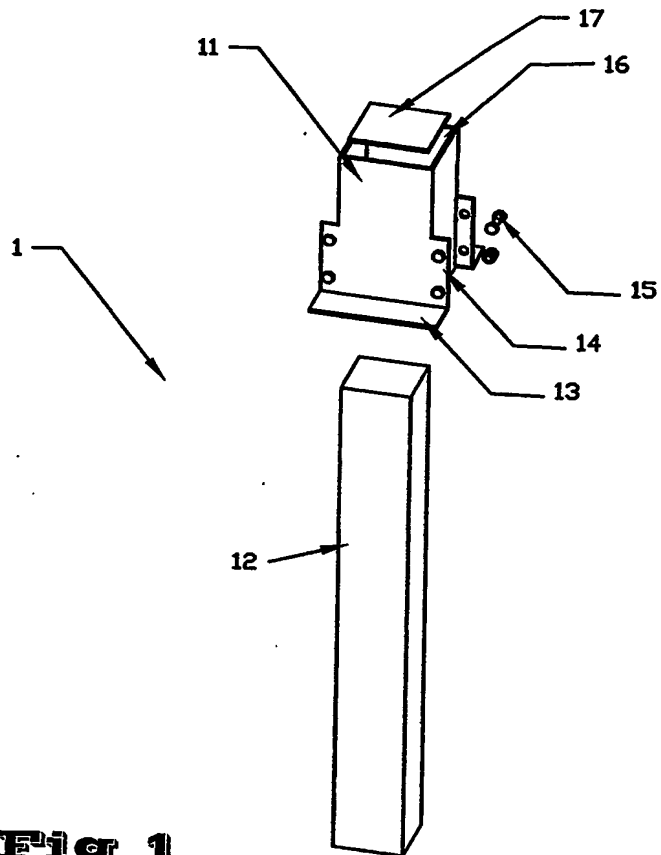
15 21. A method for using an underpinning pile system (7) as claimed in claim 13 in which said locking off said pile (72) to said pile anchor head (71) is by fastening a pile anchor head plate (71a) to inside of said tabular hollow section of said pile anchor head (71).

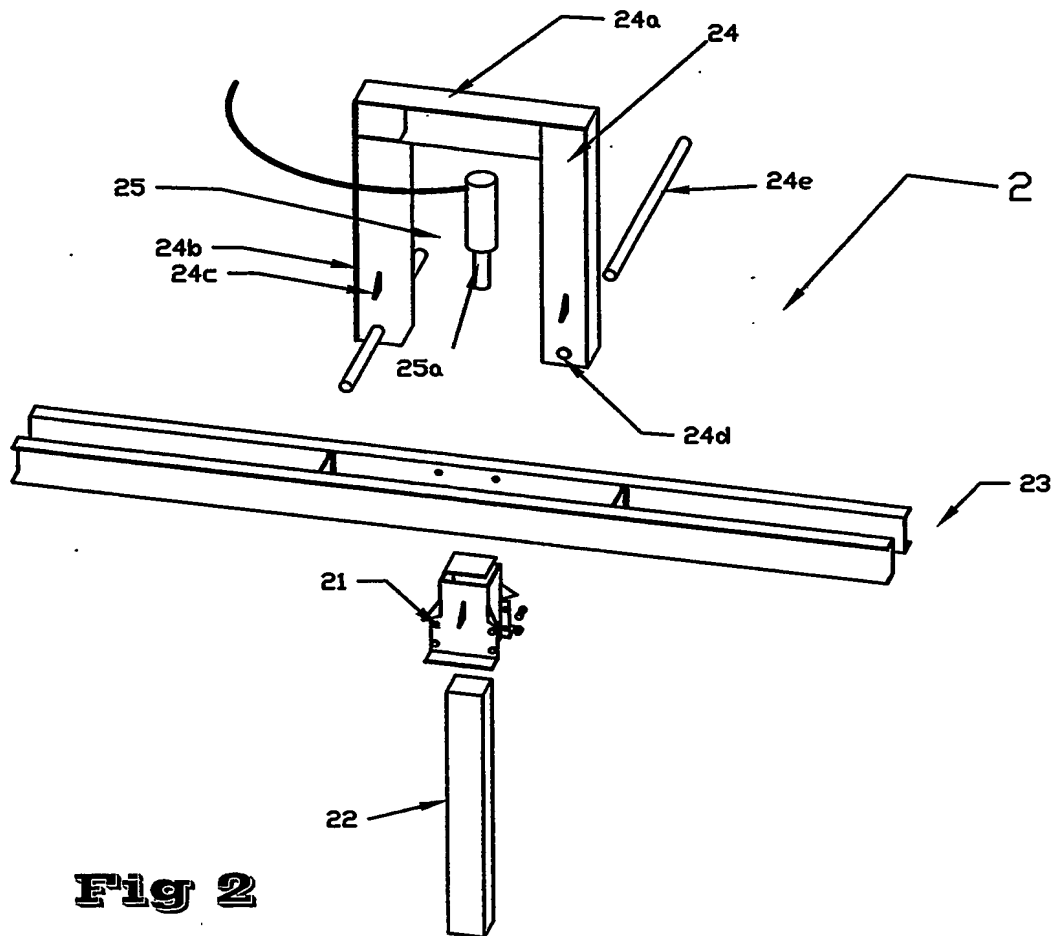
22. A method for using an underpinning pile system (7) as claimed in claim 21 in which said fastening is by welding.

20 23. A method for using an underpinning pile system (7) as claimed in claim 21 in which said fastening is by bolting.

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**Fig 1**



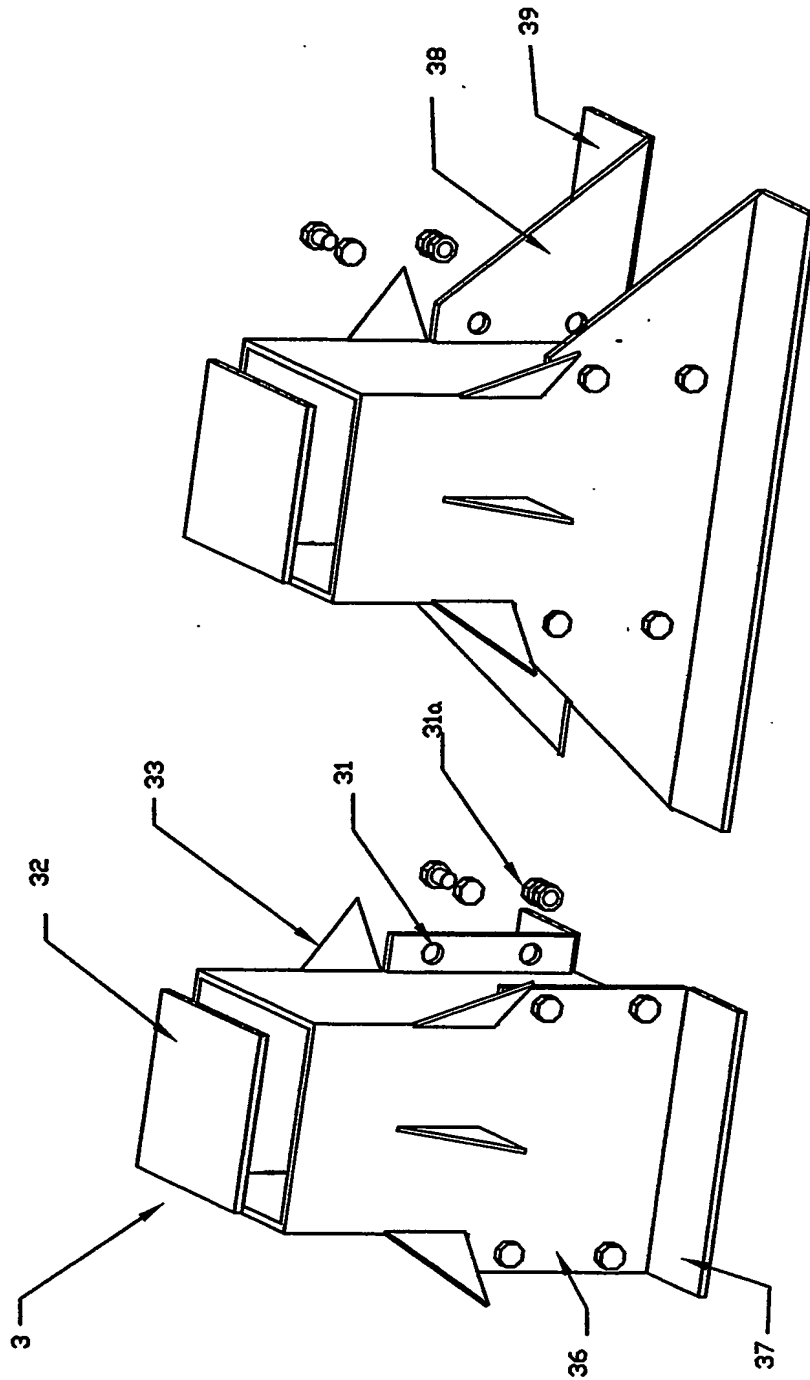
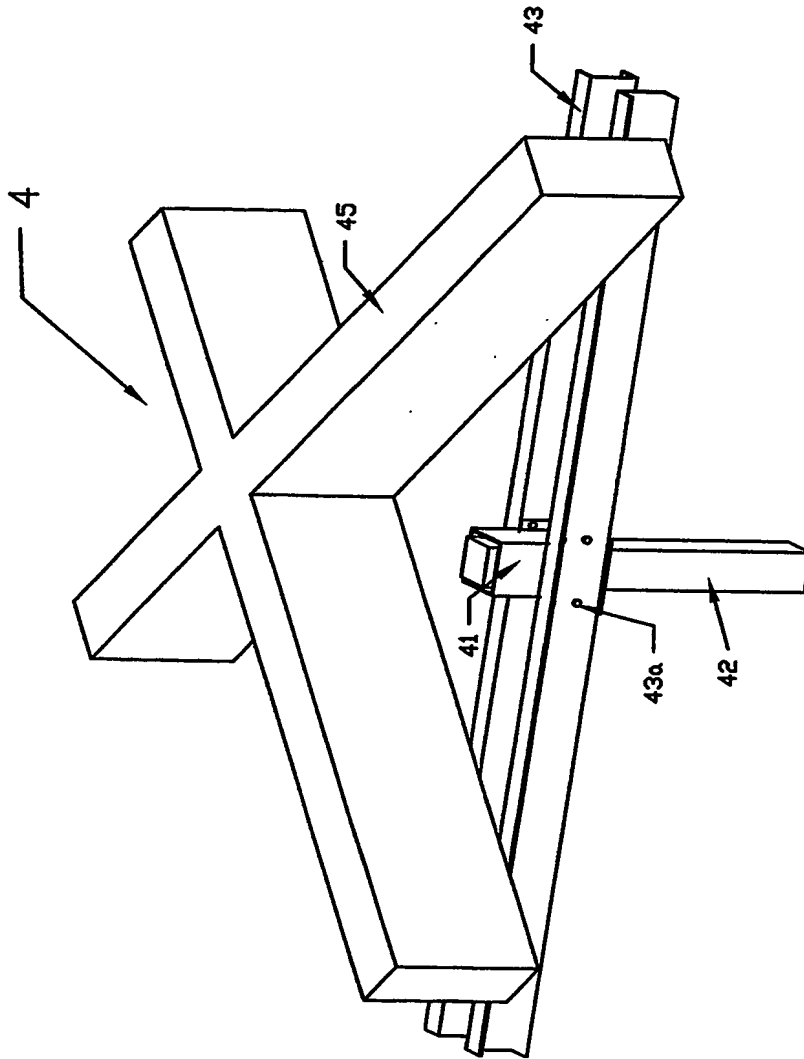


Fig 3b

Fig 3a



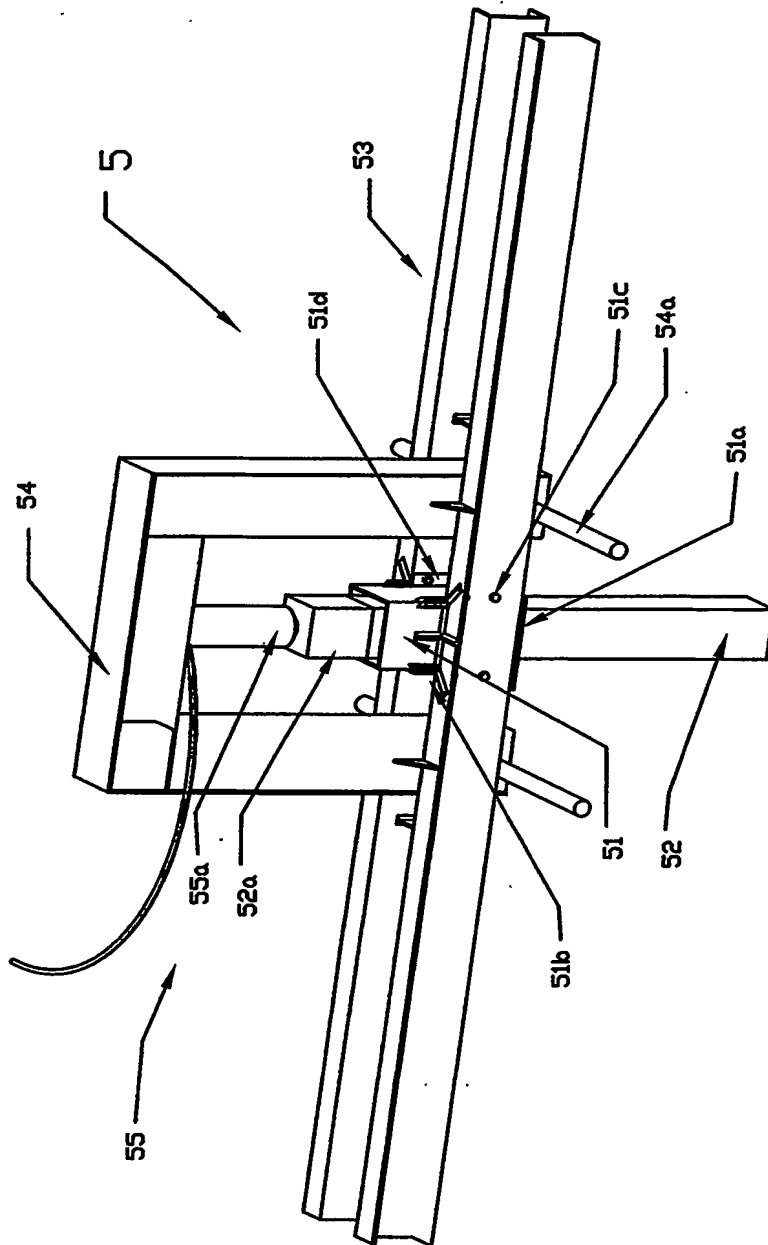


FIG 5

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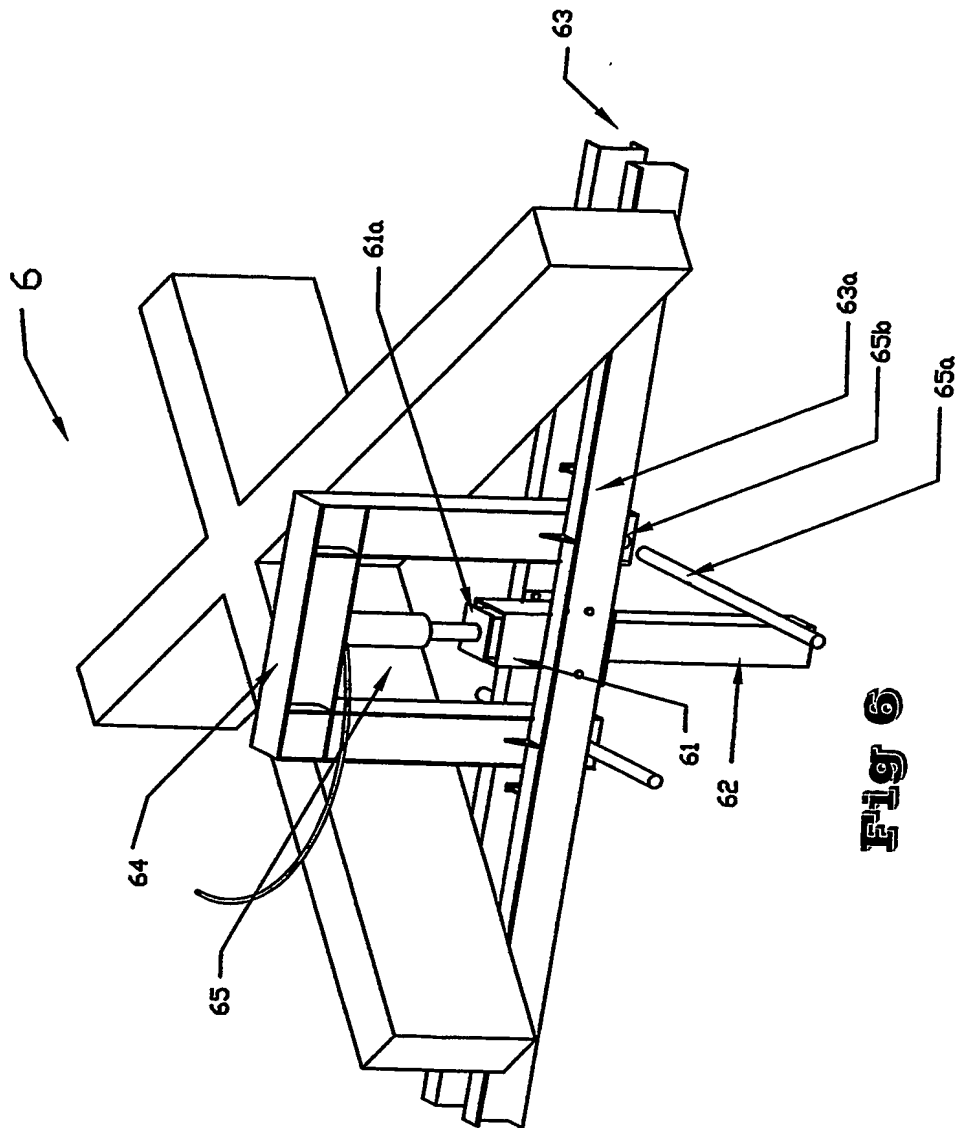


Fig. 6

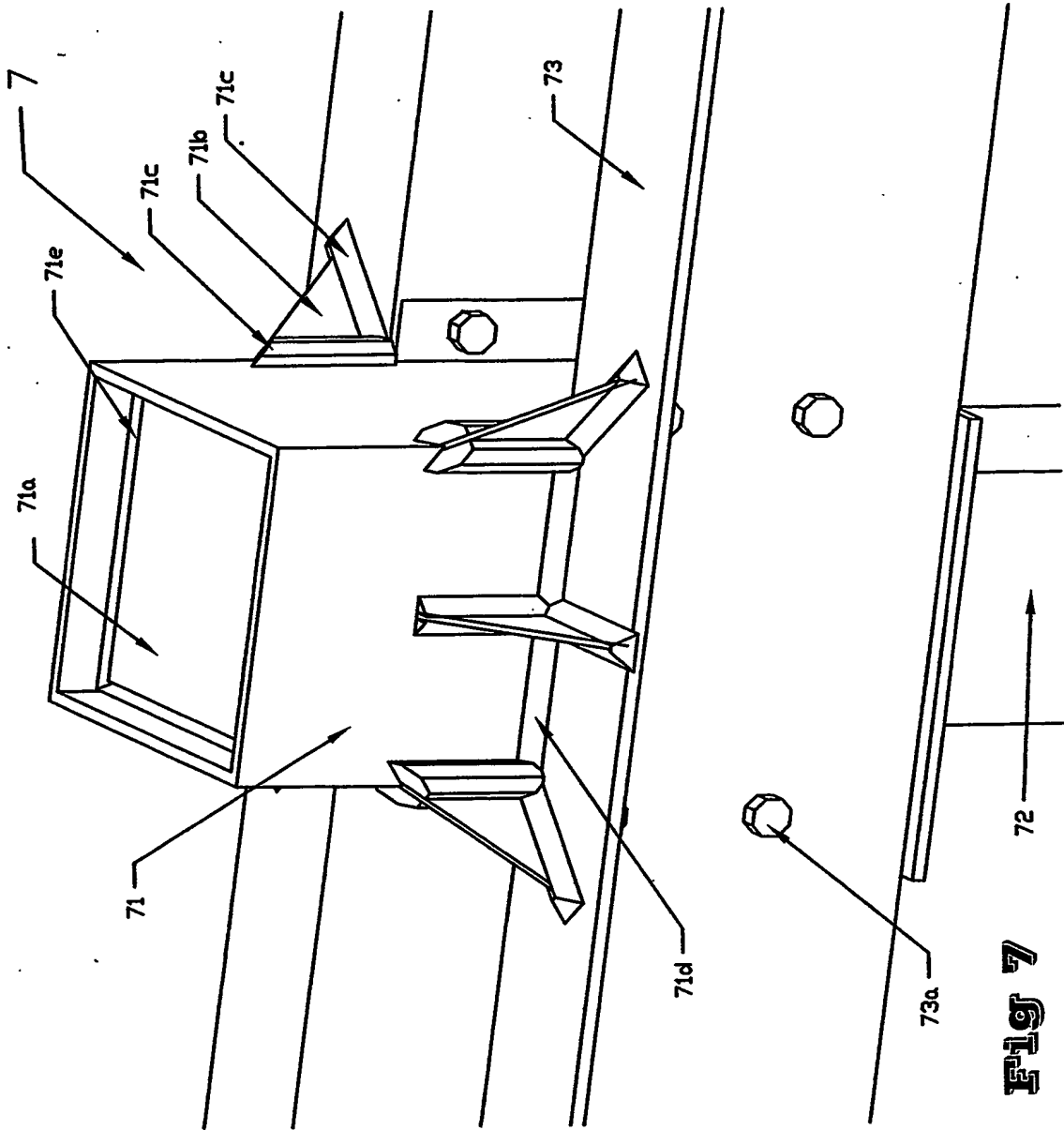


Fig 7

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ABSTRACT

PILE ANCHOR HEAD FOR AN UNDERPINNING PILE
AND
METHOD FOR DRIVING AND PRELOADING THE SAME

5 There is disclosed an underpinning pile (7) to
provide an efficient, simple and sure method in driving
and lifting the foundation and at the same time
securing the direct transference of preload without
10 further loss of preload from the building into the
newly completed driven pile(3) using the underpinning
pile system (8). The pile anchor head (1) is adapt to
receive the building load and transfer it to
practically any kind of material and shape of the pile
(3) without restricting only to the common use of steel
15 pipes in underpinning. An underpinning pile (7) used in
conjunction with the underpinning pile system (8)
consisting of assembling, jacking, driving, preloading
and locking off the preload herein as described with
its associated components consisting of a the newly
20 completed driven pile(3), pile anchor head (1), thrust
block (4) , parallel transfer twin C-channel beam (2)
and jacks is disclosed.

(The most illustrative drawing Fig 2)

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